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Study of Asymptomatic Peripheral Arterial Disease in Ischemic Stroke Patients and Associated Comorbid Conditions

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ABSTRACT
Patients with stroke and patients with transient ischemic attack (TIA) are at high risk for vascular events and may not exhibit the signs and symptoms of peripheral arterial disease (PAD). We investigated prevalence of asymptomatic PAD detected by ankle brachial index <0.9 in patients with stroke and difference between risk factor profile between patient having asymptomatic PAD and those without asymptomatic PAD. In this cross sectional hospital-based study, asymptomatic PAD was detected by ankle brachial index measurement in consecutive 100 patients with stroke. They were assessed for stroke risk factors, ankle brachial index measurement, and laboratory parameters known to be associated with stroke risk. These data was compared between patient having asymptomatic PAD and those without asymptomatic PAD. Our study demonstrates that in patients with ischemic stroke, asymptomatic peripheral arterial disease is highly prevalent. These patients had significantly higher risk factors and risk of future athero-thrombotic events could be higher, so ABI measurement can be good non-invasive tool to identify patients with greater risk of future events and thereby help in optimizing secondary preventive measures.
Key words: *Stroke, Ankle brachial index, Peripheral arterial disease*

INTRODUCTION

Peripheral arterial disease (PAD) is frequently present in patients with stroke; with a prevalence ranging between 24.1 and 51.0 %[1]. The most widely used method to detect peripheral arterial disease is the measurement of the ankle brachial index (ABI). An ABI of ≤ 0.90 is diagnostic of PAD[2]. Several studies in the general population showed that an ABI of ≤ 0.90 is independently associated with increased incidence of cardiovascular events, and stroke[3]. Moreover, the lower the ABI value, the higher the risk of overall cardiac and cerebrovascular death in patients with peripheral vascular disease[4].

In this study, we determined the prevalence of asymptomatic peripheral arterial disease in ischemic stroke patients at a tertiary care centre, by measuring ABI of 100 patients with ischemic stroke and investigated the association of ABI with age, gender, risk factors, associated co-morbidities and type of stroke.

MATERIALS AND METHODS

This study was hospital based, cross sectional study. Patients coming to PGIMS, ROHTAK with clinical and radiological diagnosis of ischemic stroke were enrolled. Total of 100 patients aged more than 40 years with diagnosis of ischemic stroke were selected. Stroke was divided according to TOAST criteria[5]. Patients' demographical details, clinical history and clinical examinations and hematological, biochemical blood analyses were performed. ABI was measured according to American Heart Association protocol for Determination of the Ankle-Brachial Index with the Doppler Method[6.] Systolic pressure was detected with 8-MHz Bidirectional Doppler probe by single operator to avoid subjective variations.. Pressures in each leg were measured and ABI calculated separately for each leg. An ABI<0.90 in either leg was considered as evidence of PAD, and an ABI >0.90 was considered as normal. Patients with symptoms of PAD (intermittent claudication, rest pain, ulcers, history of peripheral revascularization) patients with, previous history of peripheral arterial disease or Patient with traumatic injury at ankle /elbow obscuring measurement of ankle brachial index were excluded from study. Stroke patients were divided into two groups according to their ABI as either ABI < 0.9 or ABI > 0.9. Baseline features, risk factors were compared between these two groups.

STATISTICAL ANALYSIS

Statistical analyses related with this study were performed by use of SPSS 17.0 package program. The data was expressed by statistical methods like average, frequency distribution, percentage, mean & standard deviation as applicable. Comparison between groups was done by standard statistical test e.g. Chi-square and independent t test.

RESULTS

Total 100 patients were evaluated. Mean age of study group was 61.14 ± 9.9 years, out of which 27 were females and 73 were males. Baseline features of all patients are presented in Table 1. Patients with asymptomatic PAD (ABI <0.9) had mean age of 62±9 years, as compared to 59±10 years in patients without PAD. Patients with asymptomatic PAD have significantly higher blood pressure, BMI, blood glucose, triglyceride, LDL and lower HDL. Hypertension Smoking, Diabetes mellitus were found prevalent in PAD patients. Maximum patients with PAD were in age group of 50-79 years. Out of 58 patients with PAD 38(65.51%) had large vessel stroke, rest 20(38.48%) patients had lacunar stroke. Middle cerebral artery territory was found to be involved most commonly among patients with PAD.

DISCUSSION

In this study total 58% patients were found to have ABI < 0.9, which is much higher than other study reports, but similar prevalence was found in Systemic Risk Score Evaluation In Ischemic Stroke Patients (SCALA)[7], and reason for that was higher proportion of patients with atherosclerotic stroke. Mean age of patients with ABI > 0.9 was 59±10 years, where as in ABI <0.9 mean age was 62±9 years (p value 0.126), study by Sen et al[8] and Rehman et al[9] also found similar age distributions. Present study showed 77.6% of patients among those had with asymptomatic PAD had hypertension which was significantly higher when compared with patients who had ABI > 0.9(p value <0.05). Study by Rehman et al[9]. Study by Topakian et al[1], Busch et al[10], Nakano et al[11] also found significant difference in systolic blood pressure between case and control group. Banerjee et al[12] in his review also concluded similar finding whereas, Sen et al[8], Hoshino et al[13], and PIPE study[14] finding do not match with this. However According to the Framingham Heart Study, hypertension doubles the risk of PAD[15] which also favors our finding.

Smoking was significantly associated with low ABI. History of smoking was present in 82.7% among those having PAD, and 45.2% in those not having PAD, and this difference was significant statistically(p value <0.05). Plausible mechanisms by which primary and environmental tobacco

smoke exposure can increase the risk of stroke and heart disease are numerous and include carboxyhemoglobinemia, increased platelet agreeability, increased fibrinogen levels, reduced HDL-cholesterol, and direct toxic effects of compounds such as 1,3-butadiene.

Type 2 diabetes mellitus in the elderly is associated with increased incidence of vascular disease, particularly atherosclerosis of large blood vessels. In people with diabetes, the risk of PAD is increased by age, duration of diabetes, and presence of peripheral neuropathy. Our study showed there were 55.1% of patients among those having ABI < 0.9, and 16.7% of patients among those with ABI >0.9 were diabetic (p value <0.05). This finding is comparable to other studies like Hoshino et al[13], Topakian et al[1] review by Banerjee et al[12] and framingham study[15.] Hyperlipidemia is also known risk factor for accelerated atherosclerosis. In our study among those having PAD 70.6% had dyslipidemia, 59.5% patients not having PAD also had dyslipidemia. This difference was insignificant (p value >0.05) and comparable to other studies. Hoshino et al[13], Topakian et al[1], Busch et al[10], Nakano et al[11], all showed no significant association between dyslipidemia and low ABI among stroke patients. However other studies like PIPE study[14] and study by Sen et al[8] reported a significant association.

It was found that lower ABI was associated with large vessel stroke significantly. 35 patients with lacunar stroke had ABI >0.9, and 38 patients with large vessel stroke had ABI<0.9(p value <0.05). Study by Topakian et al[1] (OECROSS study) made comparable finding.

This study found that an ABI < 0.9 was associated with presence of carotid stenosis more than 50% and large vessel stroke as stroke subtype (p value 0.029). This data supports the fact that abnormal ABI could be first and foremost marker of advanced systemic atherosclerosis. In prospective study F.purroy et al[16] noted patients with large vessel stroke significantly had higher number of recurrences. Abnormal ABI was associated with stroke recurrence (32.1% vs. 13.6%, P = 0.027) and the appearance of any major vascular event (50.0% vs. 17.0%, P < 0.001). In the logistic regression analysis, adjusted for vascular risk factors, age, and large artery atherosclerosis, ABI remained as an independent predictor of vascular events. Our study finds patients with large artery stroke had significantly lower ABI. Sawayama et al[17] and PIPE study[14] also find higher prevalence of large vessel stroke among patients with ABI <0.9. In patients with ABI < 0.9 most common artery involved was found to be middle cerebral artery. Nakano et al[11] also reported significant higher involvement of middle cerebral artery in patients with low ABI, which is well comparable with our study.

CONCLUSION

Our study demonstrates that in patients with ischemic stroke, asymptomatic peripheral arterial disease is highly prevalent. These patients had significantly higher risk factors as compared to patients without asymptomatic peripheral arterial disease, and risk of future athero-thrombotic events could be higher, so ABI measurement can be good non-invasive tool to identify patients with greater risk of future events and thereby help in optimizing secondary preventive measures. Smaller study group and cross sectional design of study could be limitation of our study so large longitudinal studies are needed to confirm finding of our study.

DISCLOSURE: "Conflict of interest: None"

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